

CLAIMS

What is claimed is:

1. Retroreflective sheeting, comprising:
 - 5 a) a plurality of first open-faced cube-corner surfaces formed from a substantially rigid material to keep the first cube-corner surfaces from flexing;
 - b) a plurality of second open-faced cube-corner surfaces formed from the substantially rigid material to keep the second cube-corner surfaces from flexing, the first open-faced cube-corner surfaces and the second open-faced cube-corner surfaces being configured to retroreflect light in opposite directions; and
 - 10 c) an optical coating disposed on at least some of the first and second cube-corner surfaces.
- 15 2. The sheeting of Claim 1, wherein the optical coating includes a specular coating.
3. The sheeting of Claim 1, wherein the substantially rigid material is selected from a group consisting of thermoplastic and thermoset polymers.
4. The sheeting of Claim 1, wherein a plurality of voids form the first and second open-faced cube-corner surfaces.
- 20 5. The sheeting of Claim 1, further comprising a color coating on at least some of the first and second open-faced cube-corner surfaces.

6. The sheeting of Claim 1, wherein the sheeting is broken into chips and mixed into or placed on at least one or more of the following: a coating, a paint, a polymer, or an adhesive.
7. The sheeting of Claim 6, wherein the coating, paint, or polymer includes a substantially transparent polymer.
8. The sheeting of Claim 7, wherein the substantially transparent polymer includes at least one of acrylic, polyester, polyurethane, or polyurea.
9. The sheeting of Claim 6, further comprising a top coat covering the at least one of the coating, the paint, the polymer, or the adhesive.
10. The sheeting of Claim 1, wherein the sheeting is breakable into chips.
11. The sheeting of Claim 1, further comprising patterns on the retroreflective sheeting having no open-faced cube-corner surfaces.
12. The sheeting of Claim 11, wherein the patterns form walls in the retroreflective sheeting that extend from the carrier substrate to a prism ridge, the thickness of the walls being in the range of between about 25.4 and 1,270 micrometers (0.001 and 0.05 inches).
13. The sheeting of Claim 1, further comprising a substantially clear coating on the optical coating.
- 20 14. The sheeting of Claim 13, wherein the substantially clear coating includes alumina, silica, a fluoride, a metal oxide, or a combination thereof.

15. Retroreflective sheeting, comprising:
 - a) a first plurality of three-sided indentations in a material to form first open-faced cube-corners in a first side of the material;
 - b) a second plurality of three sided indentations in a second side of the material to form second open-faced cube-corners opposing the first open-faced cube-corners; and
 - c) a reflective coating disposed on at least a portion of the first and second three-sided indentations.
16. The sheeting of Claim 15, wherein the sheeting is broken into chips.
17. Retroreflective sheeting, comprising:
 - a) a structure having a first side and a second side;
 - b) a plurality of open-faced cube-corner surfaces formed in the first side;
 - c) a plurality of open-faced cube-corner surfaces formed in the second side;
 - 15 and
 - d) a metal layer formed on substantially all of the surfaces.
18. The sheeting of Claim 17, wherein the sheeting is breakable into chips.
19. A method for forming retroreflective sheeting, comprising:
 - a) forming a first plurality of open-faced cube-corner surfaces from a substantially rigid material in a first side of a substrate; and
 - b) forming a second plurality of open-faced cube-corner surfaces from the substantially rigid material in a second side of the substrate.
20. The method of Claim 19, wherein step a) and step b) are carried out at approximately the same time.

21. The method of Claim 19, wherein step a) and step b) are continuously carried out.
22. The method of Claim 19, further comprising the step of forming the sheeting into chips.
- 5 23. Retroreflective chips comprising open-faced cube-corner surfaces facing in opposite directions, the surfaces having an optical coating thereon.
24. Optical sheeting having a first side and a second side, each side having open-faced cube-corner surfaces.
25. The optical sheeting of Claim 24, wherein the optical sheeting includes thermoplastic and thermoset polymers.
- 10 26. The optical sheeting of Claim 25, wherein the optical sheeting includes at least one of acrylic polymers, polyurethane, polyurea, polycarbonate, silicone, metallic acrylate, or diacrylate.
27. The optical sheeting of Claim 24, further comprising an optical coating formed on the surfaces.
- 15 28. The optical sheeting of Claim 27, wherein the optical coating includes a specular coating.
29. The optical sheeting of Claim 24, wherein the optical sheeting is breakable into chips or flakes.

30. Retroreflective sheeting having a first side and a second side, each side including open-faced cube-corner surfaces.
31. The retroreflective sheeting of Claim 30, further comprising a specular coating adjacent substantially all of the open-faced cube-corner surfaces.
- 5 32. Two-sided retroreflective sheeting having open-faced cube-corner surfaces on each side.
33. Retroreflective sheeting having a plurality of open-faced cube-corner surfaces provided on a substrate, an optical coating disposed on at least some of the cube-corner surfaces, and a fill coat disposed on at least some of the optical coating, 10 the sheeting including an array of apertures therethrough.
34. The sheeting of Claim 33, further comprising an adhesive layer disposed on the substrate.
35. The sheeting of Claim 34, further comprising a release liner disposed on the adhesive layer.
- 15 36. Retroreflective sheeting comprising a plurality of open-faced cube-corner surfaces, an optical coating disposed on at least some of the surfaces, the sheeting including a plurality of apertures therethrough.
37. The sheeting of Claim 36, wherein the retroreflective sheeting includes a substantially transparent polymer.
- 20 38. The sheeting of Claim 37, wherein the substantially transparent polymer includes at least one of acrylic, polyester, polyurethane, or polyurea.

39. The sheeting of Claim 36, wherein the cube-corner surfaces are provided on a substrate.
40. The sheeting of Claim 39, wherein the substrate has a first surface and a second surface and wherein the cube-corner surfaces are provided in the first surface and the second surface.
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41. The sheeting of Claim 39, further comprising an adhesive liner disposed on the substrate.
42. The sheeting of Claim 36, further comprising a fill layer provided on at least a portion of the optical coating.
- 10 43. A projection screen comprising a plurality of open-faced cube-corner prisms.
44. The projection screen of Claim 43, wherein the projection screen is a front-projection screen or a rear-projection screen.
45. The projection screen of Claim 43, wherein the plurality of open-faced cube-corner prisms are disposed on a plurality of chips.
- 15 46. The projection screen of Claim 43, wherein the screen includes a plurality of one-sided retroreflectors dispersed in a substantially transparent material.
47. The projection screen of Claim 46, wherein the substantially transparent material includes polyurea.
48. The projection screen of Claim 45, wherein at least some of the plurality of chips are two-sided open-faced cube-corner chips.
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49. The projection screen of Claim 45, wherein at least some of the plurality of chips are one-sided open-faced cube-corner chips.
50. The projection screen of Claim 49, wherein at least a portion of a backside of at least some of the one-sided open-faced chips cube-corner chips includes an optical microstructure.
51. The projection screen of Claim 43, wherein at least a portion of a side of at least some of the one-sided open-faced cube-corner chips is textured.
52. The projection screen of Claim 45, wherein at least a portion of a side of at least some of the one-sided open-faced cube-corner chips has a color coating thereon.
- 10 53. The projection screen of Claim 43, wherein at least some of the plurality of open-faced cube-corner prisms have varying prism pitches.
54. The projection screen of Claim 43, wherein at least a portion of the plurality of open-faced cube-corner prisms is textured.
55. The projection screen of Claim 43, wherein the plurality of open-faced cube-corner prisms are disposed in a film.
- 15 56. The projection screen of Claim 55, wherein a front surface of the film includes a lenticular.
57. The projection screen of Claim 43, further comprising an optical coating disposed on at least some of the plurality of open-faced cube-corner prisms.

58. The projection screen of Claim 43, wherein at least some of the plurality of open-faced cube-corner prisms include a color coating thereon.
59. A projection screen paint or wallpaper comprising a plurality of open-faced cube-corner prisms.
- 5 60. The projection screen print or wallpaper of Claim 59, wherein the plurality of open-faced cube-corner prisms are disposed on a plurality of chips.
61. A projection screen comprising a plurality of prism clusters disposed in a film.
62. A plurality of prism clusters disposed within a film or in a paint for forming a projection screen.
- 10 63. A seamless projection screen comprising a plurality of two-sided open-faced prisms.
64. A method for forming a projection screen comprising coating a substrate with a liquid that includes a plurality of open-faced cube-corner prisms.
- 15 65. An optical structure comprising a plurality of chips having at least one side being retroreflective, the chips being dispersed in a substantially transparent polymer.
66. The optical structure of Claim 65, wherein the plurality of chips have a second side that is retroreflective.
- 20 67. The optical structure of Claim 65, wherein the substantially transparent polymer includes at least one of acrylic, polyester, polyurethane, or polyurea.

68. The optical structure of Claim 66, wherein the first and second sides include open-faced cube-corner surfaces.
69. The optical structure of Claim 65, wherein the polymer includes at least one of extruded, molded, cast, printed, and coated polymers.
- 5 70. Retroreflective sheeting, comprising:
 - a plurality of open-faced cube-corner surfaces formed from a substantially rigid material to keep the cube-corner surfaces from flexing, the material including a low index of refraction; and
 - a coating disposed on substantially all of the cube-corner surfaces, the coating including a high index of refraction such that a difference between the low index of refraction and the high index of refraction is sufficient to cause retroreflection of light impinging on the cube-corner surfaces.
- 10 71. The sheeting of Claim 70, wherein the coating includes submicron or nanoparticles of dielectrics.